# Madrean Archipelago Rapid Ecoregional Assessment
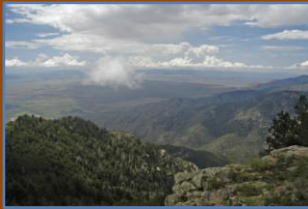
## Rapid Ecoregional Assessments

Working with agency partners, BLM is conducting rapid ecoregional assessments (REAs) covering much of the American West. The goal of REAs is to characterize 1) the status of ecological resources, 2) their potential to change at a landscape scale in response to increasing development, changing climate, the spread of invasives, and altered fire regimes, and 3) potential priority areas for conservation, restoration, and development. REAs are a first step in BLM's Landscape Approach, which considers larger geographic areas to more fully recognize natural resource conditions, processes, and trends, natural and human influences, and opportunities for resource conservation, restoration, and development. The landscape approach seeks to identify important ecological values and patterns of environmental change that may not be evident when managing smaller, local land areas.

REAs are rapid, landscape-scale assessments of the resource values of an ecoregion, their distribution and status, their interactions with major change agents, and their projected future status. REAs include:

- Assessment of current and forecasted trends in change agents and their effects on conservation elements
- Characterization of overall ecoregion integrity
- A baseline on resource and change agent status to evaluate and guide future management actions
- Conceptual models that characterize valuable natural resources and describe key ecological attributes and indicators of ecological status
- An ecoregion-wide geospatial data library that can be used to inform local scale activities, actions, and projects and place them into a more ecologically meaningful context
- Information that may be used for cumulative impacts analyses
- Context for existing land use plan decisions

## Phase I, Task 2 Update

This brochure highlights results and outcomes of the pre-assessment.

## Input and Review Opportunities

Update webinars will be held at the end of each REA task to update stakeholders on task completion and provide an opportunity for input on the next task.

## REA Phases and Tasks

### PHASE I: PRE-ASSESSMENT

**Task 1: Initiate Project**
- Engage Team Members and Participants
- Develop Work Plan for Pre-Assessment

**Task 2: Conduct Pre-Assessment**
- Characterize the Ecoregion
- Select Conservation Elements (CEs), Change Agents (CAs), and Management Questions (MQs)

### PHASE II: ASSESSMENT

**Task 1: Assessment Work Plan**
- Develop Work Plan: Characterize Assessments to Be Conducted, Assessment Approach

**Task 2: Data And Methods For Assessments**
- Inventory, Acquire, Evaluate Datasets
- Develop Process Models

**Task 3: Conduct Assessments**
- Conduct Analyses
- Generate Data, Findings

**Task 4: Final Report**
- Prepare Final REA Report, Documents

# Madrean Archipelago REA Status

The Madrean Archipelago REA was initiated in October 2012 and is scheduled for completion in September 2014. During the pre-assessment, REA participants and the contractor identified management issues of concern which then informed the selection of conservation elements and change agents to be assessed in this REA. The assessment phase is now underway, with an assessment work plan completed and data investigation for use in the assessment in progress. The characterization of the ecoregion, the conservation elements, and the management issues and change agents of concern are highlighted in this brochure.
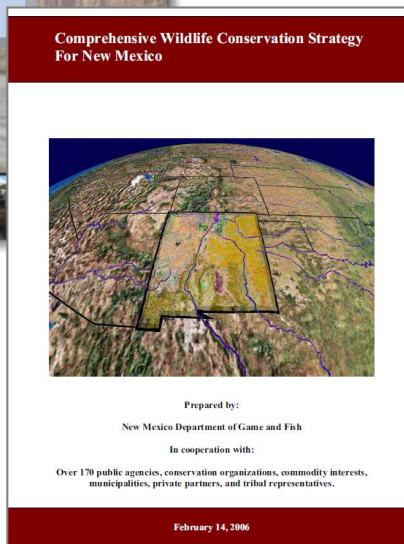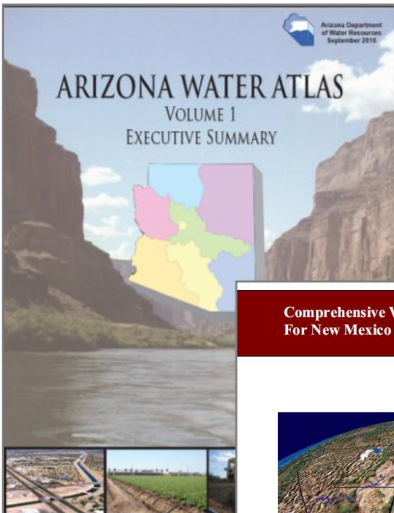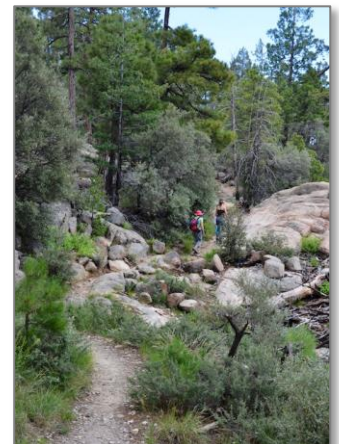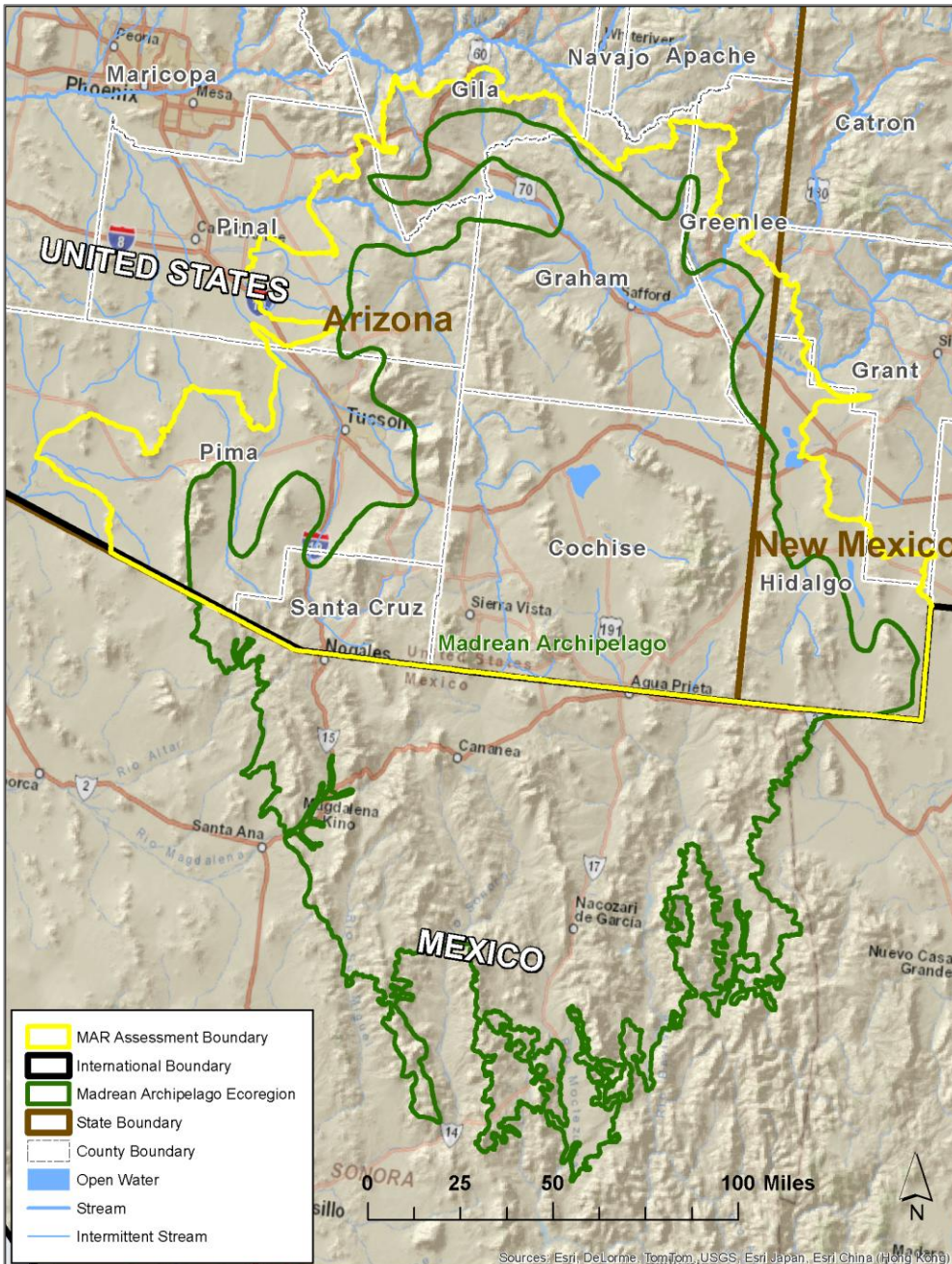






## REA Pre-Assessment Scoping Process

To understand the character of the Madrean Archipelago ecoregion in the U.S. and the issues it faces, and to identify the management questions (MQs), conservation elements (CEs), and change agents (CAs) to be assessed in this REA, the REA team undertook a scoping process that included review of relevant literature, a series of workshops with experts in the ecoregion, and other consultation with agency staff and other experts. A key series of scoping workshops were the "Development Forums" held in BLM offices in Las Cruces, New Mexico and Safford and Tucson, Arizona with land managers, biologists, and other experts from a variety of federal and state agencies. Workshop participants identified critical management issues, framed as questions that, if answered, could inform decision-making around resource management. Information gathered in these forums and through literature review served to identify the MQs, CEs, and CAs of interest in this ecoregion.

# Madrean Archipelago Ecoregion

Spanning the U.S.-Mexico border, the 18.5 million-acre Madrean Archipelago ecoregion is located in southeastern Arizona, southwestern New Mexico, and north central Mexico; it is shown as the green outline in the map below. The yellow boundary in the map outlines the 15.7 million-acre area being assessed in this REA. The ecoregion is characterized by isolated, forested mountain ranges surrounded by a virtual sea of intervening deserts and grasslands; thus, the mountains in this area are known as "Sky Islands." The basin and range topography, diversity of soils, and arid, monsoonal climate, are the physical drivers shaping its biological diversity, while hydrology and fire are among the major natural ecosystem processes influencing the biota of this ecoregion. The ecoregion is located within the Madrean Pine – Oak Woodlands, a globally significant biodiversity hot spot, and harbors the highest diversity of mammals, birds, bees, and ants in the contiguous United States. Large elevation gradients and topographic roughness contribute to high diversity of species and biotic communities. The ecoregion is at the intersection of the temperate zone to the north and sub-tropics to the south where several major desert and forest biotic influences converge, including the Rocky Mountains, Sierra Madre, the piedmont and plains of the western Sierra Madre, Sonoran Desert, and Chihuahuan Desert.







Legend:
- MAR Assessment Boundary
- International Boundary
- Madrean Archipelago Ecoregion
- State Boundary
- County Boundary
- Open Water
- Stream
- Intermittent Stream

Sources: Esri, DeLorme, TomTom, USGS, Esri Japan, Esri China (Hong Kong)

# Issues Facing Natural Resource Managers

Anthropogenic activities are critical to the economic and social well-being of the human residents of any region. However, anthropogenic activities and influences can have a range of effects on the biota of a region. For natural resource managers, understanding the relationship between anthropogenic activities and the natural resources is critical. REA participants identified the following issues to be evaluated in relation to the natural resources of the ecoregion.

## Water Availability/Altered Hydrology

Water availability is an on-going, driving issue permeating all aspects of life in this ecoregion. The primary anthropogenic water uses include municipal water supplies, irrigation for agricultural crops, industrial uses (such as mining), and livestock. Streams, cienegas, playas, and other aquatic habitats are vital to the wildlife and aquatic fauna of the ecoregion as well as critical habitats in their own right. Water withdrawals are impacting the aquatic ecosystems of this ecoregion and the fauna that depend on them.
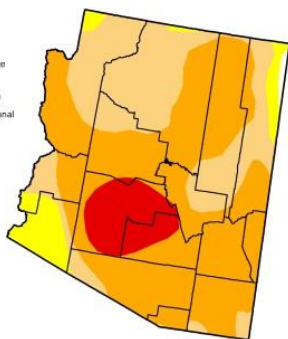




U.S. Drought Monitor — Arizona

Intensity:
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

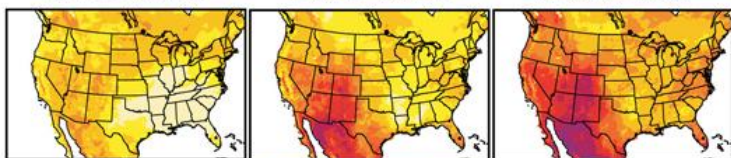Released Thursday, March 15, 2012

## Climate Change

Altered precipitation patterns, higher temperatures, and increased frequency and intensity of drought are among the direct impacts of climate change. Climate change also influences processes such as fire, hydrologic regimes, and the spread of invasive species, and interacts with human influences (e.g., fire suppression), creating synergistic effects on ecosystems and species. For example, drought-stressed trees in many areas of the sky islands are weakened and therefore more susceptible to insect pests. The combination of increased fuels from fire suppression and drought or insect-stressed trees may be contributing to catastrophic fires that may fundamentally alter the character and functioning of sky island forest and woodland habitats. Climate change is likely already affecting the ecological systems and biota of the ecoregion and will continue to do so into the future.



Number of Extremely Hot Seasons Per Decade
2010-2019  2020-2029  2030-2039

events per decade
0   3   6   9

Credits: U.S. Drought Monitor: National Drought Mitigation Center at the University of Nebraska-Lincoln, USDA, NOAA
Climate projections: Noah Diffenbaugh, Stanford Woods Institute for the Environment

# Issues Facing Natural Resource Managers

The following issues were also identified by REA participants to be evaluated in relation to the natural resources of the ecoregion

## Fire

Fire is a natural ecosystem process that has shaped the woodlands and grasslands of this ecoregion. The frequency and intensity of fires is shifting in response to fuel build-up resulting from fire suppression, a changing climate, the spread of invasive plant species that promote fire, and other factors. Altered fire regimes are changing the composition and structure of the woodlands and forests of the sky islands, and loss of vegetation cover after severe fire affects aquatic ecosystems in the associated watersheds. Interactions between invasive grasses and fire are altering the character of the semi-desert grasslands in some areas.







## Development

Anthropogenic infrastructure and land uses, such as urban areas, roads, utility corridors, industry, energy development, agriculture and other activities are vital to the well-being of the human community. However, these features can also have negative impacts on ecosystems and species, including habitat loss, fragmentation, and pollution. US-Mexico border infrastructure and activities are a particular concern in relation to habitat fragmentation and degradation.

## Non-native and Native Invasive Species

Non-native species have invaded different ecological systems in the ecoregion, with a range of negative impacts. Native mesquites and creosotebush have also expanded well beyond their historical distribution. Non-native grasses and the native woody shrubs are altering the character of the semi-desert grasslands in this ecoregion. The non-native American bullfrog and various crayfish species are shifting the balance among aquatic fauna.





## Grazing

Livestock grazing is an important and widespread economic activity throughout the ecoregion. Depending on a variety of factors, grazing has potential to have both positive and negative effects on grasslands, riparian systems, and other ecosystems of the ecoregion. Intensive grazing can alter species composition; interacting with fire, grazing also has the potential to promote increases in woody shrub cover.

Credits: Border fencing, ©Matt Clark

**Madrean Archipelago Rapid Ecoregional Assessment: Phase 1 Update**

# Characterizing the Ecoregion

Natural features and processes determine the type and patterns of biodiversity in the ecoregion, and human activities directly or indirectly influence the status and distribution of that biodiversity. The "sky island"/"desert sea" topography and associated elevation gradient, as well as temperature regime and water availability, shape the composition and distribution of the upland ecological systems, both in the mountains and the wide valleys of this ecoregion. Semi-desert grasslands and shrubland blanket the valleys, mixed deciduous and conifer woodlands cloak the lower and middle mountain slopes, and conifer forests and woodlands cover the highest elevations. The hydrologic regimes of the aquatic systems of the ecoregion are determined by the timing and quantity of precipitation and the topography and soils of the ecoregion. Stream networks flow from the mountains to the valleys, with topography and groundwater patterns determining the presence of associated cienegas, marshes, and other wetlands. Wetlands isolated from stream networks, such as playas, are driven by topography, soils, and surface water flow.

While these natural characteristics fundamentally shape the biodiversity of the ecoregion, human activities influence its status and character. Altered climate and fire regimes, in conjunction with invasive non-native and native species, are altering the composition and structure of upland ecological systems. Development, including urban areas, roads, utilities, and other infrastructure can result in the direct loss of upland habitat, as well as habitat fragmentation. Aquatic ecological systems are changing due to the altered hydrologic regimes associated with water withdrawals and climate change, as well as historical down-cutting of stream beds. Invasive non-native species are also altering aquatic faunal assemblages and riparian vegetation.

## Physical or "Slow" Drivers: Climate and Physiography

Temperature — Precipitation — Landform / Topography — Elevation

### Process or "Fast" Drivers

Weather Patterns: Drought, Monsoon — Hydrology: Ground & Surface — Fire Regime

**Connected Stream and Wetland System** — **Isolated Wetland System** — **Montane Upland System** — **Valley Upland System**

- Water withdrawals
- Altered hydrology
- Altered climate
- Invasive species
- Grazing
- Agriculture
- Development
- Pollution

- Altered climate
- Altered fire
- Invasive species
- Grazing
- Agriculture
- Border activities
- Development

## Human Drivers: Direct Uses and Indirect Influences

# Conservation Elements (CEs) and Conceptual Models

The conservation elements (CEs) listed below were selected for assessment in this REA. A detailed conceptual model was developed for each; the conceptual models include descriptive text and diagrams characterizing the CE and its life history or ecosystem dynamics, as well as key ecological attributes and indicators that may be used to assess its ecological status.





## Species CEs

| Category | Species Name |
|---|---|
| Mammal | Desert bighorn sheep |
| Mammal | Pronghorn |
| Mammal | Coues deer |
| Mammal | Black-tailed prairie dog |
| Mammal | Nectar-feeding bat assemblage |
| Bird | Grassland bird assemblage |
| Reptile | Ornate box turtle |
| Amphibian | Chiricahua leopard frog |
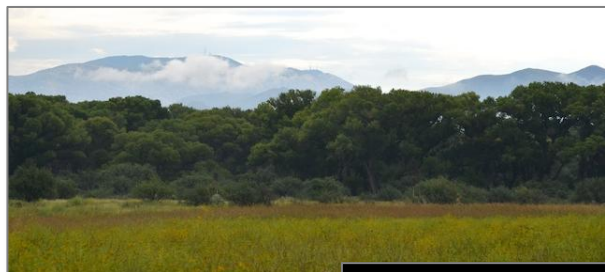
## Ecological System CEs

| Ecological System Name | % of Ecoreg |
|---|---|
| *Valley Dryland Ecological Systems* | 56.0% |
| Chihuahuan Creosotebush Desert Scrub | 13.2% |
| Apacherian-Chihuahuan Mesquite Upland Scrub | 19.5% |
| Apacherian-Chihuahuan Semi-Desert Grassland & Steppe | 18.2% |
| Madrean Encinal | 5.1% |
| *Connected Stream and Wetland Ecological Systems* | 4.3% |
| North American Warm Desert Riparian Woodland & Shrubland, Mesquite Bosque & Stream | 3.3% |
| North American Arid West Emergent Marsh/Cienega & Pond | 1.0% |
| North American Warm Desert Lower Montane Riparian Woodland & Shrubland & Stream | <1% |
| *Montane Dryland Ecological Systems* | 13.4% |
| Madrean Pinyon-Juniper Woodland | 5.8% |
| Montane Conifer-Oak Forest & Woodland | 2.8% |
| Mogollon Chaparral | 4.8% |
| *Isolated Wetland Ecological Systems* | <1% |
| North American Warm Desert Playa & Ephemeral Lake | <1% |